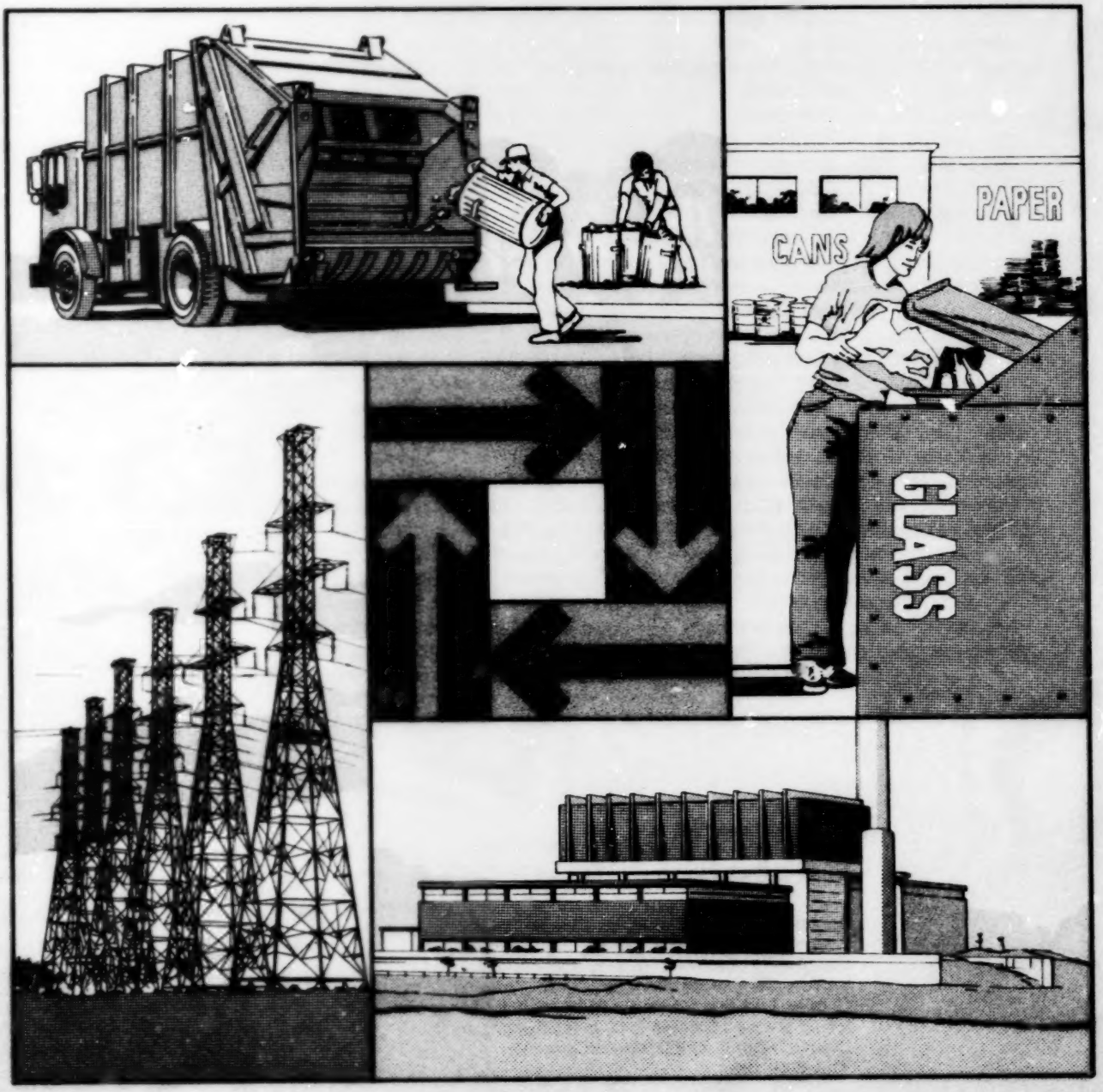
Ontario

Ministry of Energy — Honourable Robert Welch, Q.C., Minister

Ministry of the Environment — Honourable Keith C. Norton, Q.C., Minister

# Energy and Materials Recovery from Municipal Solid Waste



84- 3700 /

# Contents


| | |
|---|---|
| **Introduction** | 3 |
| **Solid Waste Management in Ontario** | 5 |
| Collection | 5 |
| Transfer stations | 5 |
| Source separation | 6 |
| Waste processing | 6 |
| Landfill | 8 |
| Development of a waste management plan | 8 |
| **How to Start an Energy from Municipal Solid Waste Project** | 9 |
| Initial considerations | 9 |
| Preliminary assessment | 9 |
| Detailed feasibility study | 10 |
| Final design and financing | 10 |
| Implementation of energy recovery projects | 10 |
| We're here to help | 11 |


© Queen's Printer for Ontario
Printed: June 1983

ISBN 0-7743-7586-3

Copies available at $2.50 each from the Ontario Government Bookstore, 880 Bay St., Toronto. Out-of-town customers write to Publications Services Section, 5th Floor, 880 Bay St., Toronto, Ontario, M7A 1N8. Telephone 965-6015. Toll free long distance 1-800-268-7540, in Northwestern Ontario 0-Zenith 67200. MasterCard and Visa accepted.

# Introduction

Each year, Ontario municipalities collect close to seven million tons of refuse from households, industries, offices and apartment buildings. Although most of this waste is currently disposed of in landfill sites, public acceptance of this option is on the decline and new sites are becoming difficult to locate. In addition, potentially useful resources are being buried at a high cost to society.

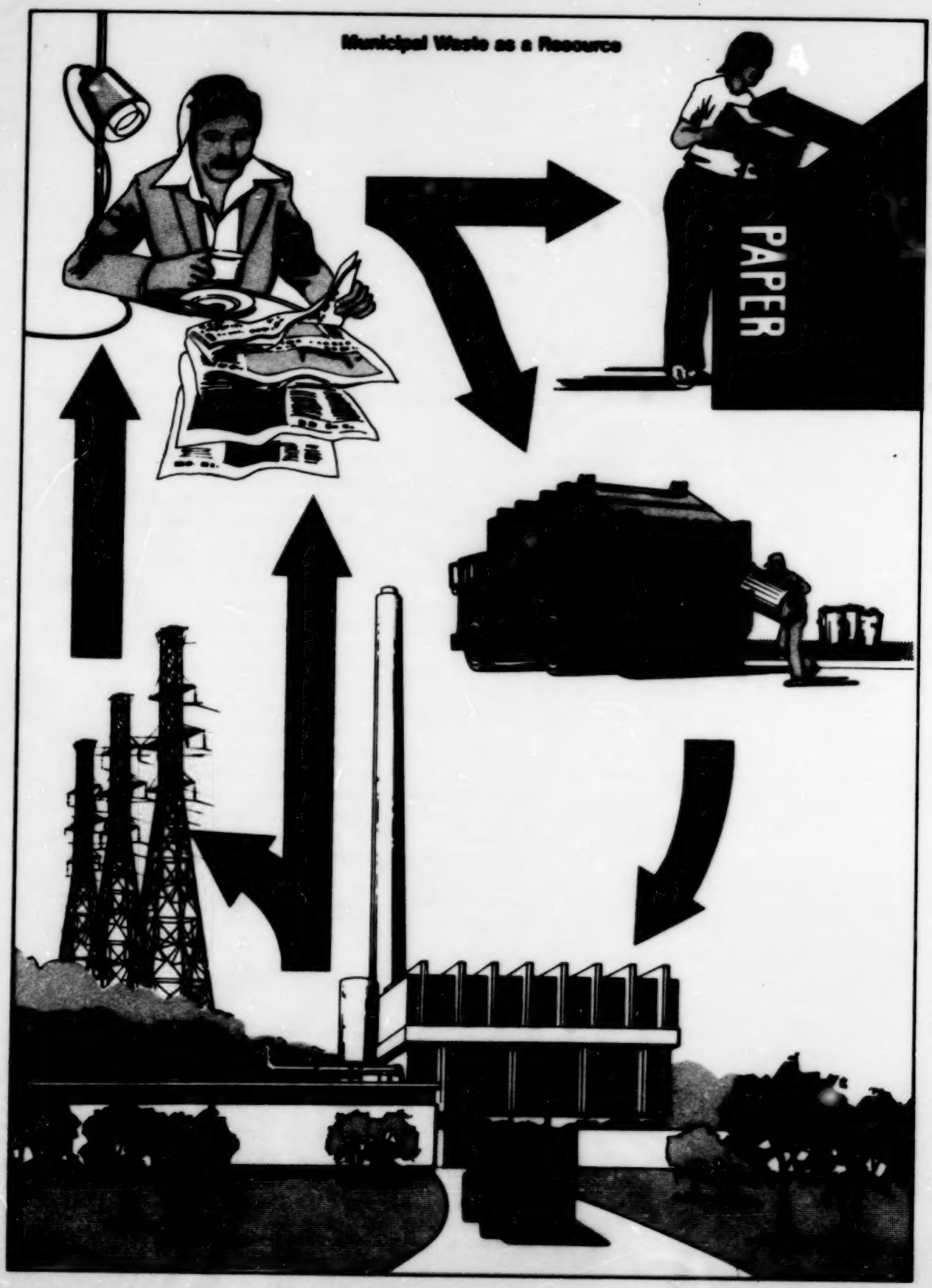
The Ontario government is actively promoting the development of alternatives to reduce the volume of waste currently taken to landfill sites. These alternatives include waste reduction, source separation and energy recovery.

Interest in resource recovery is on the rise. Municipal solid waste is a potential source of re-cycled paper, cardboard, glass and metals. After the extraction of these materials, municipal solid waste can yield yet another valuable resource – energy.

More and more municipalities are looking to municipal solid waste as an energy source. At present, it can be used to produce steam or electricity for commercial sale, offsetting the costs of waste disposal.

The successful implementation of an energy-from-waste project requires the participation and co-operation of the private and public sectors. The solid waste industry has an important role to play in providing equipment and the necessary technological expertise. In addition, the Ontario government is seeking private sector participation in both the ownership and operation of energy-from-waste plants.

The Ontario government helps municipalities develop solid waste management systems which are part of the municipality's waste management master plan. The development of a plan which outlines the role for energy and materials recovery requires a clear understanding of the components of a solid waste management system. These components are briefly discussed in the following pages.


Municipal Waste as a Resource
PAPER

# Solid Waste Management in Ontario

In Ontario, municipal governments are responsible for collecting, handling and disposing of waste from residential and small commercial sources as well as handling and disposing of waste from industrial and larger commercial sources. Private waste management companies are generally responsible only for the collection of waste from industrial and large commercial sources.

Several materials are excluded from both municipal and private collection including liquid and hazardous substances. Nuisance wastes, such as very dusty materials, may also be excluded from transfer stations and processing plants but accepted if hauled directly to disposal sites.

A complete waste management system includes waste collection, transfer, source separation, and landfill as well as energy and materials recovery. Collection and landfill are included in all waste management systems, while the remaining components are optional. If energy and materials recovery are included, the quantity of landfill is reduced significantly.

Municipalities wishing to develop a complete waste recovery system should begin by negotiating collection contracts which are flexible enough to permit hauling of garbage to an energy-from-waste facility at some future date and to allow the implementation of source separation programs.

**Collection**

Collection of municipal solid waste is usually the responsibility of local municipalities and private companies. Handling and disposal may also be carried out by one or both of these entities, but in most regional municipalities and restructured counties in Ontario, this additional responsibility has been assumed by the upper tier municipal organization.

Collection services are an important consideration in planning an energy-from-waste facility, since any new handling and disposal facilities will affect these services. If, for example, the location at which the collection vehicle discharges its load is changed, an adjustment of collection routes may be required. This sometimes changes the number of collection vehicles needed (either more or less are required) and the number of staff. Such changes influence the cost of energy-from-waste operations.

**Transfer stations**

When a waste disposal site or a waste processing plant is located at a considerable distance from the point of collection, the cost of transporting the waste can be high. Using a transfer station reduces the transportation costs since a transfer vehicle can carry a load which is four or five times greater than that carried by a collection vehicle.

**Source separation**

Source separation for material recovery requires the public to separate the various components of solid waste before the waste is collected. Since the materials are not mixed with other materials in the waste stream, they remain relatively clean and therefore more readily reusable. The Ministry of the Environment provides financial and other incentives to encourage source separation projects.

Since newspaper, cardboard and fine paper which is separated from the rest of the waste is a potential source of energy, source separation reduces the amount of waste available for energy recovery. The potential reduction in the energy value of waste delivered to the plant should be taken into account in the plant design and in the financial analysis of the energy-from-waste plant.

*Newspaper is a potential source of material and energy.*

**Waste processing**

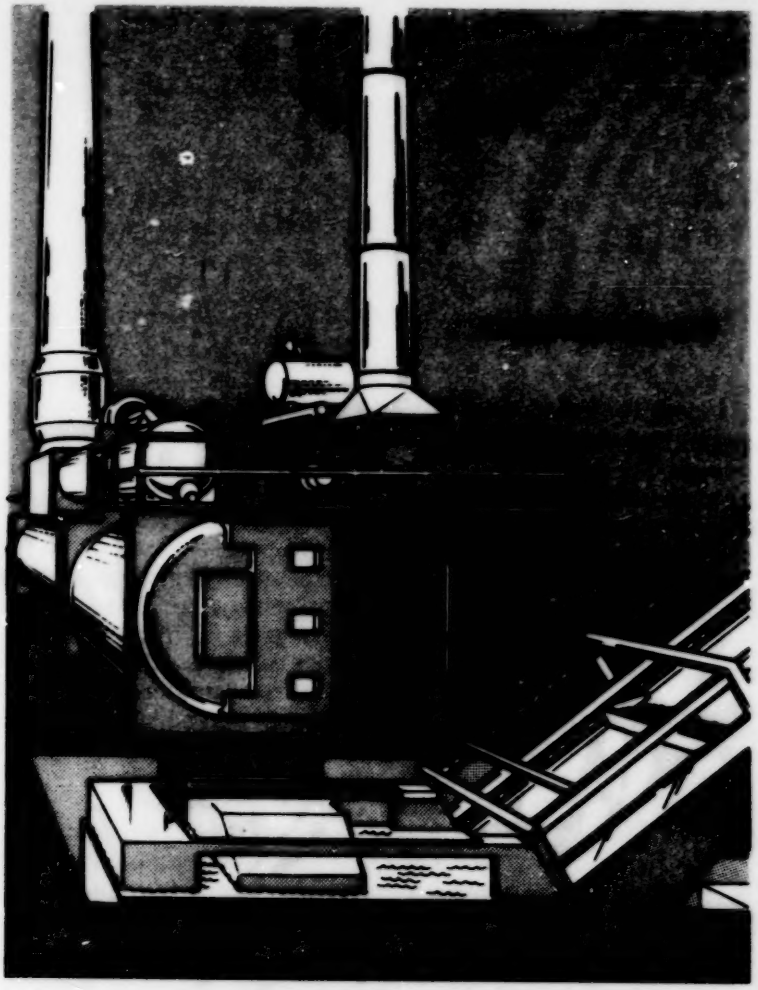
The term "waste processing" is applied to energy recovery and materials recovery as well as to processes that reduce the volume and nuisance components of waste prior to disposal.

As processing is more capital intensive than disposal by landfill, decisions on waste processing options should be made on the basis of reliable economic information. Detailed information should be obtained on waste quantities and composition. This is particularly important for commercial and industrial waste because the total quantity to be disposed of may be reduced significantly by prior recovery of materials or wastes. Detailed information on markets for recoverable materials should also be collected.

If accurate data on quantity are not available from weighscale measurement, approximate estimating methods for determining waste quantities should be used.

A procedure for estimating waste quantities from truck counts has been developed in a report prepared for the Ministry of the Environment and the Waste Management Advisory Board, called "Solid Waste Management Cost Accounting System". Basically, the method involves three steps:

1. recording the number of trucks entering the site and the appropriate volume for each for a one-week period
2. converting the total volume to the weight estimate, using factors provided



3. calculating the annual tonnage figure based on appropriate seasonal adjustments (which are provided)

Information on waste composition is much more difficult to obtain. It is best to consider the major waste streams — residential, commercial and industrial, as follows:

*Residential:* Provincial averages for rural and urban populations are adequate

*Commercial:* A survey of the major commercial establishments will provide a better estimate of both quantity and composition. For example, is there a high percentage of cardboard and paper waste?

*Industrial:* Industrial sources may contribute large volumes of inert or bulky wastes which should be identified by means of a survey. It may be advisable to consider weighing the waste from some sources if the quantity is high. Some inert wastes could be taken to special sites, rather than to designated landfill sites.

Potential markets for materials and for energy from waste also require analysis. The best markets for energy from waste are industries or hospitals with year-round needs rather than facilities that use energy only for seasonal heating purposes.

The technology for extracting energy from municipal waste is varied and developing rapidly. The emphasis of the Ontario Government's energy-from-municipal-solid-waste program will be on relatively proven technology. Research and demonstration projects fall under other programs.

Relatively proven processes for extracting energy from waste include:

1. waterwall incineration or mass burning
2. modular incinerator
3. semi-suspension burning
4. production of refuse-derived fuel (RDF) in a fluff or densified form. (RDF is normally used as a supplemental fuel to replace a portion of the conventional fuel in existing equipment. Typical applications for RDF include utility boilers and cement kilns.)

### Landfill

Neither source separation nor waste processing will eliminate the need for landfill disposal. Such measures can only reduce the volume of waste that is used for landfill, thus increasing the life of a given disposal site. Depending on the process selected, waste processing can also substantially reduce pollution and nuisance problems.

The only final disposal option available now or in the foreseeable future is landfill.

*Energy and material recovery from waste reduces the volume of landfill.*

### Development of a waste management plan

All components of a waste management system are interrelated. No single component should be considered in isolation.

The first step in developing a waste management plan that includes energy and materials recovery is the preparation of a *waste management planning study*. The study should take into account all existing and potential elements of the system and should cover a 20-year period.

In many cases, the waste management system required will not be complex. Only a limited number of facility options and markets for recovered materials and energy will be available. Under these circumstances, standard engineering methods of analysis are adequate.

For complex systems involving several competing facility options, standard methods of analysis are insufficient. For such cases, the Ministry of the Environment has developed a computer model for system design that can analyze a variety of different scenarios to help select an optimal system.

The Ministry of the Environment will fund up to 50 per cent of a waste management study. The ministry also offers technical assistance, in the preparation of such a study.

# How to Start an Energy from Municipal Solid Waste Project

As part of its Energy from Waste (EFW) program, the Ministry of Energy provides technical and non-capital assistance as well as financial assistance to municipalities and private interests to encourage them to develop energy from waste projects. The EFW program encompasses forest and biomass waste and agricultural waste as well as municipal waste.

The ministry also maintains up-to-date information on EFW plants and equipment and can direct enquirers to other sources of information. In addition, the ministry advises municipalities and private companies on consulting services available in Ontario.

**Initial considerations**

All potential participants in a project should be identified at an early stage. Participants will include:

- all agencies controlling the waste produced (municipalities, waste management companies, possibly some companies producing large quantities of waste at a single source)
- agencies responsible for waste handling and disposal
- potential markets for energy (municipalities, utilities, industries and institutions such as hospitals)
- approving agencies

If any of these agencies make a commitment to a project, they should be involved at the earliest possible time, and should either participate in meetings or be informed regularly of the project's progress.

The planning process required to bring any project, small or large, to completion is extremely complex. Problems due to complexity alone have resulted in aborted projects, long delays, and unnecessary costs. The situation must be recognized early, addressed and resolved by all project participants. In essence, the planning process itself must be carefully planned.

**Preliminary assessment**

The Ministry of Energy will carry out a preliminary economic and financial assessment of an energy-from-waste project at no cost to the enquirer provided the project meets certain criteria. To carry out such a preliminary assessment, the enquirer should provide available data on waste quantities, energy markets and tipping fees. A computer model will then be used to analyze capital and operating cost data.

The assessment has two primary objectives:

1. to determine if the proposal is feasible from an engineering point of view
2. to determine if the preliminary costs derived from information on waste availability, markets, operating costs and capital costs compare favourably with costs from conventional energy sources and future waste management costs

**Detailed feasibility study**
If the preliminary assessment is positive, the participants can enter into an agreement to undertake a detailed feasibility study. The Ministry of Energy will provide up to 50 per cent of the costs of consulting services to carry out the feasibility assessment, up to a maximum of $500,000.

Cost sharing arrangements are typically as follows:
province — 50 per cent;
municipality — 25 per cent;
energy customer — 25 per cent.
It should be stressed that both municipalities and the private sector must contribute to the study costs.

Detailed feasibility studies include an examination of the technical feasibility of a proposed project, an accurate estimate of costs and revenues, an evaluation of all legal and environmental considerations and a description of the means of financing a project.

**Final design and financing**
In the final design planning stage, engineering specifications are prepared, a financing plan approved, and marketing agreements obtained. Draft contracts and agreements are drawn up, approval documents prepared, and an ownership/construction/operation model chosen.

At this stage, as in the previous stage, the Ministry of Energy will provide up to 50 per cent of the costs of consulting services to carry out the engineering design development. Again, both municipalities and the private sector must contribute to the study costs.

For information on other forms of assistance which may be available through provincial and federal programs, contact the Ministry of Energy.

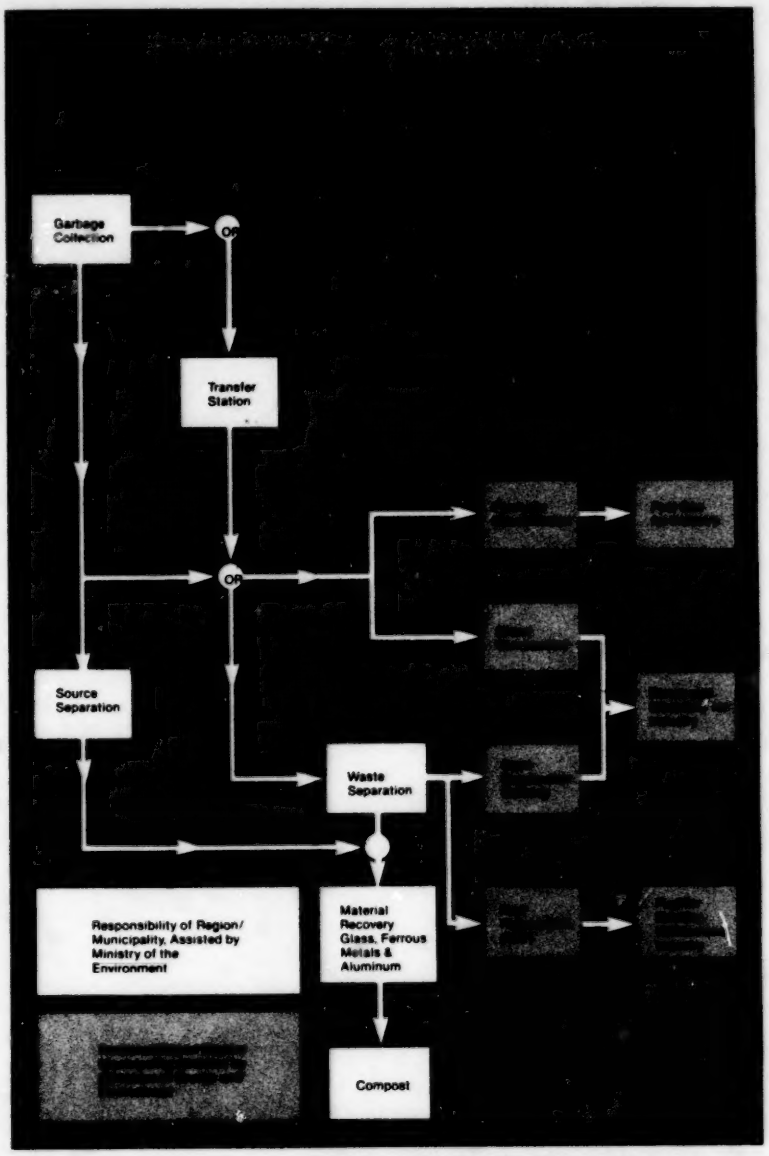
**Implementation of energy recovery projects**
Before an investment in an energy-from-waste project is considered, the following requirements should be met:

*A secure supply of inexpensive waste must be available.* Municipalities should know how much waste they receive and the composition of the waste. The costs of the energy from waste alternative can then be compared with other alternatives.

*A dependable market for the energy must exist.* Ideal customers are industries or hospitals with a year-round requirement for energy, rather than facilities that use energy for seasonal heating only.

*The conversion technology must be proven.* Only projects using proven technology will be considered under this program.

*Economic and financial viability must be assured.* An energy-from-waste project can work only if it guarantees a fair market price for the energy customers. In addition, meeting of operating costs and debt repayment must be assured.




***A sound ownership, management and operational structure must be in place.*** The sponsors must be capable of operating and maintaining an industrial-type plant. The operation can be contracted to private companies that provide specialized services in the waste management field.

## We're here to help

The Ontario Ministries of Energy and the Environment are interested in making the most of the province's municipal solid waste resource. Both ministries have experts on staff who have broad experience in this field.

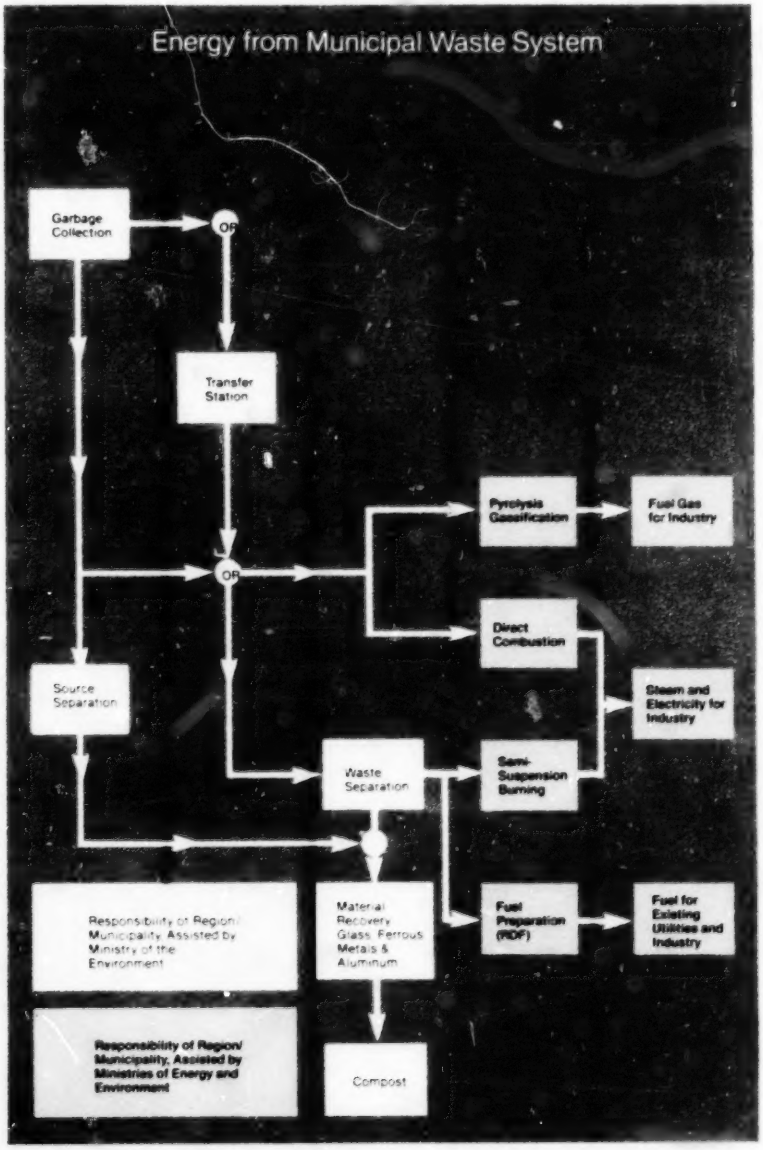
If you are interested in energy and/or materials recovery, let us know. We can advise you on the best way to proceed, and help smooth the way for your municipal solid waste project.

Enquiries regarding the assistance provided by the Ministries of Energy and the Environment for the development of municipal solid waste programs can be directed to either the Ministry of Energy or the Ministry of the Environment. If the enquiry relates specifically to energy recovery, contact:

Municipal Solid Waste Unit,
Ontario Ministry of Energy,
56 Wellesley St. W.,
Toronto, Ontario
M7A 2B7
Telephone: (416) 965-7705

If the query relates to waste management or materials recovery, contact:

Waste Management Branch,
Ontario Ministry of the Environment,
135 St. Clair Ave. W.,
Toronto, Ontario
M4V 1P5
Telephone: (416) 965-9671




***A sound ownership, management and operational structure must be in place.*** The sponsors must be capable of operating and maintaining an industrial-type plant. The operation can be contracted to private companies that provide specialized services in the waste management field.

## We're here to help

The Ontario Ministries of Energy and the Environment are interested in making the most of the province's municipal solid waste resource. Both ministries have experts on staff who have broad experience in this field.

If you are interested in energy and/or materials recovery, let us know. We can advise you on the best way to proceed, and help smooth the way for your municipal solid waste project.

Enquiries regarding the assistance provided by the Ministries of Energy and the Environment for the development of municipal solid waste programs can be directed to either the Ministry of Energy or the Ministry of the Environment. If the enquiry relates specifically to energy recovery, contact:

Municipal Solid Waste Unit,
Ontario Ministry of Energy,
56 Wellesley St. W.,
Toronto, Ontario
M7A 2B7
Telephone: (416) 965-7705

If the query relates to waste management or materials recovery, contact:

Waste Management Branch,
Ontario Ministry of the Environment,
135 St. Clair Ave. W.,
Toronto, Ontario
M4V 1P5
Telephone: (416) 965-9671